CHAUCER'S CANTERBURY TALES.

I.—The Knight's Tale.

Four years ago we commenced in the 'Penny Magazine' a series of articles, under the denomination of 'Chaucer's Portrait Gallery,' which had for their main object the hope of making one of the greatest but most neglected of English poets more familiar to his countrymen. The portion of his writings that then engaged our attention was the Prologue or Introduction to the 'Canterbury Tales,' in which the characters of the pilgrims to Thomas-a-Beckett's shrine are all described, and the plan of the poem explained. We now propose to introduce our readers to some of the Tales told by the different pilgrims on their journey.

In the treatment of the Tales our aim will be, whilst transcribing many passages which may convey to an ordinary reader the worthiest idea of their author, to preserve at the same time most strictly the continuous interest of the story, by making our own connecting prose, as far as possible, a pure reflex, in feeling, thought, and words, of the poetry we omit. Glossarial or slight explanatory and illustrative notes will, as before, be given at the foot of each page. With regard to the verse, we have only to request the reader's attention to the rule—adopted for the avoidance of unnecessary marks of accentuation—*that when the spelling of a word differs from the ordinary spelling, it will be found in a great number of instances to mark at once the pronunciation required*:—thus, the spelling generally being modernized, we have considered "muste" need not be printed "musté" to show that the word must is to be pronounced as a dissyllable.

The methods of accentuation we have adopted are these:—1. Words in which the accent falls upon a different syllable than the one at present emphasized, are marked with an acute accent, as honóur for hónour. 2. Where additional syllables (exclusive of diphthongs) are to be sounded, without any change in the spelling or in the emphasis, they are pointed out by the grave accent, as writè, morè. 3. In Chaucer's time the individual sounds of both vowels in diphthongs appear to have been commonly preserved in speech, a custom still lingering in the north of England; and in writing such words therefore as creature, truely, and absolution, they are marked creäture, truëly, and absolution, and

must be pronounced accordingly, just as in Leeds to this day bread is continually heard of as breäd, and dream as dreäm.

Following Chaucer's own order, we commence with the magnificent 'KNIGHT'S TALE.' The pilgrims, it will be remembered, in telling their stories, speak in the first person. Thus it is the Knight, of course, that here speaks:—

> Whilom,* as olde stories tellen us,
> There was a duke that hightè† Theseus;
> Of Athens he was lord and governor,
> And in his timè such a conqueror
> That greater was there none undér the sun.
> Full many a riche country had he won.
> What with his wisdom, and his chivalry,
> He conquer'd all the regne of Feminie,‡
> That whilom was yclepèd§ Scythia,
> And wedded the fresh queen Hypolita;
> And brought her home with him to his countrý
> With muchel glory and great solemnity,
> And eke her younge sister, Emily.

And if it were not too long, I would have told you fully the manner of this conquest, and of the great battle fought betwixt the Athenians and the Amazons, and how Hypolita had been besieged; also of the feasts that took place at her wedding, and of the temple raised in her honour, on her coming to the home of her conqueror and husband. But I must forbear, and so will begin again where I left off. When Theseus was almost come to Athens,

> In all his weal, and in his moste pride,

he saw that

> —— there kneelèd in the highe way
> A company of ladies, tway and tway,
> Each after other, clad in clothès black,
> But such a cry, and such a woe they make
> That in this world n' is creäture living
> That ever heard such another waimenting;‖
> And of this cry ne would they never stenten¶
> Till they the reinès of his bridle henten.**

Who are ye, that thus at my coming home disturb so my festival with crying? inquired Theseus. Is it in envy of mine honour, that ye thus complain? Or who hath harmed or offended you? Tell me, if that your wrongs may be mended; and also why ye be thus all clad in black?

The oldest of the ladies then spake:—

> She saide, Lord, to whom Fortúne hath given
> Victory, and as a conqueror to liven,
> Nought grieveth us your glory and your honóur,
> But we beseeche you, of mercy and succóur,
> Have mercy on our woe and our distress,
> Some drop of pity through thy gentleness
> Upon us wretched women let now fall;
> For certes, Lord, there n' is none of us all
> That she n' hath been a duchess or a queen:
> Now we be caitives,†† as it is well seen;
> Thankèd be Fortune and her falsè wheel
> That none estate ensureth to be wele.

And, certes, Lord, abiding your coming, we have waited here in the temple of Clemency all this past fortnight: now, then, help us, since it lies in thy power to do so. I, wretched wight, that weep and wail thus, was wife to King Orpaneus that died at Thebes; cursed be the day! And all those that here join with me in this array and this lamentation, have lost their husbands at that town, when it was besieged. And yet now Creon, the old lord of Thebes, in his ire, and in his iniquity, and in order to dishonour the dead, has caused all the bodies to be thrown on a heap together, and will neither suffer them to be buried nor burnt; but in despite maketh hounds to eat them.*

And then the ladies fell flat upon their faces, and once more cried piteously,

> Have on us wretched women some mercý,
> And let our sorrow sinken in thine heart.
> This gentle duke down from his courser start
> With hearte piteous, when he heard them speak;
> Him thoughte that his heart would all to-break,†

to see those who were once of such great estate, now cast down so low. He took them up and held them in his arms, whilst he comforted them, swearing as a true knight that he would so take vengeance of Creon, that all Greece should speak of his crimes, and their just punishment.

Theseus would not even enter Athens, that he was so near, and spend there a few hours, but having sent Hypolita his queen, and her sister Emily, into the town, he displayed his banner, and rode forth towards Thebes, with all his host. There he slew Creon, and won the city:

> And to the ladies he restored again
> The bodies of their husbands that were slain,
> To do the obséquies, as was then the guise.

It would occupy too long to describe the great clamour and lamentations which the ladies made at the burning of the bodies of their deceased husbands, or the honourable manner in which Theseus afterwards dismissed them. But I may say, shortly, that when the duke had slain Creon, and won Thebes, as he lay all night in the field, the pillers,‡ as they went about among the heaps of dead searching to see if any wounded men were yet alive and required their care,

> they found
> Through girt with many a grievous bloody wound
> Two younge knightes, liggingß by and by,‖
> Both in one armes,¶ wrought full richèly,
> Of which, two, Arcite hight that one,
> And he that other, hightè Palamon.
> Not fully quick,** nor fully dead they were;
> But by their coat-armóur, and by their gear
> The heralds knew them well in special
> As those that weren of the blood reül††
> Of Thebès, and of sisters two yborn.

The pillers took them out of the heap, and carried them tenderly to the tent of Theseus, who, finally, sent them to Athens, to remain in perpetual captivity. He then rode home to Athens, crowned with laurel as a conqueror, and there lived the remainder of his life in joy and honour. As to Palamon and Arcite, they

* We cannot better illustrate the views of the ancients on the subject of the burial of dead bodies, than by observing that one of the greatest tragedies of one of the greatest of Tragedians, the Antigone of Sophocles, which at this moment is being represented in a musical shape to an English audience, turns entirely upon the misery and ruin brought on by the refusal of a king of Thebes of the rights of burial to a nephew, because he had been a traitor to his country. That king was Creon; probably the very same man that Chaucer refers to.

† To is frequently used by Chaucer to augment the force of the verb to which it is prefixed. He has To-hewen, To-burst, &c.

‡ Foragers.

§ Our northern readers, about Leeds and elsewhere, will not need to be told that ligging means lying: many a Leeds man would be more likely to be interested in being told that lying means ligging; so commonly is the latter word used among the humbler classes there.

* Formerly. † Was called.
‡ The kingdom, or queendom as it should rather be called, of the *females*, or Amazons. § Called.
‖ Lamentation. ¶ Stint or cease. ** Laid hold of.
†† Wretches.
‖ Side by side. ¶ One kind of armour.
** Alive. †† Royal.

dwelt, full of anguish, in the tower that was to be their eternal prison: no amount of gold might ransom them.

[To be continued.]

The Art of Writing well.—To the influence of association on language it is necessary for every writer to attend carefully, who wishes to express himself with elegance. For the attainment of correctness and purity in the use of words, the rules of grammarians and critics may be a sufficient guide: but it is not in the works of this class of authors that the higher beauties of style are to be studied. As the air and manner of a gentleman can only be acquired by living habitually in the best society, so grace in composition must be attained by an habitual acquaintance with the classical writers. It is indeed necessary for our information, that we should peruse occasionally many books which have no merit in point of expression; but I believe it to be extremely useful to all literary men, to counteract the effect of this miscellaneous reading by maintaining a constant and familiar acquaintance with a few of the most faultless models which the language affords. For want of some standard of this sort we frequently see an author's taste in writing alter much to the worse in the course of his life, and his later productions fall below the level of his essays.—*Dugald Stewart's Philosophy of the Human Mind.*

Sugar-making in Jamaica.—I saw the whole process of sugar-making this morning. The ripe canes are brought in bundles to the mill, where the cleanest of the women are appointed, one to put them into the machine for crushing them, and another to draw them out after the juice has been extracted, when she throws them in an opening in the floor close to her; another band of negroes collects them below, when, under the name of *trash*, they are carried away to serve for fuel. The juice, which is itself at first a pale ash-colour, gushes out in great streams, quite white with foam, and passes through a wooden gutter into the boiling-house, where it is received into the siphon, or 'cock-copper,' where fire is applied to it, and it is slaked with lime in order to make it granulate. The feculent parts of it rise to the top, while the purer and more fluid flow through another gutter into the second copper. When little but the impure scum on the surface remains to be drawn off, the first gutter communicating with the copper is stopped, and the grosser parts are obliged to find a new course through another gutter, which conveys them to the distillery, where, being mixed with the molasses, or treacle, they are manufactured into rum. From the second copper they are transmitted into the first, and thence into two others, and in these four latter basins the scum is removed with skimmers pierced with holes, till it becomes sufficiently free from impurities to be *skipped* off, that is, to be again ladled out of the coppers and spread into the coolers, where it is left to granulate. The sugar is then formed, and is removed into the *curing-house*, where it is put into hogsheads, and left to settle for a certain time, during which those parts which are too poor and too liquid to granulate drip from the casks into vessels placed beneath them: these drippings are the molasses, which, being carried into the distillery, and mixed with the coarser scum formerly mentioned, form that mixture from which the spirituous liquor of sugar is afterwards produced by fermentation: when but once distilled it is called 'low wine;' and it is not till after it has gone through a second distillation that it acquires the name of rum. The 'trash' used for fuel consists of the empty canes; that which is employed for fodder and for thatching is furnished by the superabundant cane-tops, after so many are set apart as are required for planting. After these original plants have been cut, their roots throw up suckers, which in time become canes, and are called *ratoons;* they are far inferior in juice to the planted canes; but then, on the other hand, they require much less weeding, and spare the negroes the only laborious part of the business of sugar-making—the digging holes for the plants; therefore although an acre of ratoons will produce but one hogshead of sugar, while an acre of plants will produce two, the superiority of the ratooned piece is very great, inasmuch as the saving of time and labour will enable the proprietor to cultivate five acres of ratoons in the same time with one of plants. Unluckily, after three crops, or five at the utmost, in general the ratoons are totally exhausted, and you are obliged to have recourse to fresh plants.—*M. G. Lewis's Jamaica:—Murray's Home and Colonial Library.*

Tartar Surgery.—The author had fallen from his horse, and gives the following account of his cure:—When I recovered my senses, I found myself in a house, but every thing appeared dark and indistinct, and I felt as if I had fallen from my horse two months before. The emperor sent me a Tartar surgeon, for he and his court were fully persuaded that for falls Tartar surgeons were better than Europeans. And, to confess the truth, although the mode of treatment was of a barbarous description, and some of the remedies appeared useless, I was cured in a very short time. This surgeon made me sit up in my bed, placing near me a large basin filled with water, in which he put a thick piece of ice, to reduce it to a freezing-point. Then stripping me to the waist, he made me stretch my neck over the basin, and, with a cup, he continued for a good while to pour the water on my neck. The pain caused by this operation upon those nerves which take their rise from the pia-mater was so great and insufferable, that it seemed to me unequalled. The surgeon said that this would stanch the blood and restore me to my senses, which was actually the case; for in a short time my sight became clear, and my mind resumed its powers. He next bound my head with a band, drawn tight by two men, who held the ends, whil. he struck the intermediate part vigorously with a piece of wood, which shook my head violently, and gave me dreadful pain. This, if I remember rightly, he said was to set the brain, which he supposed had been displaced. It is true, however, that after this second operation my head felt more free. A third operation was now performed, during which he made me, still stripped to the waist, walk in the open air, supported by two persons; and, while thus walking, he unexpectedly threw a bowl of freezing cold water over my breast. As this caused me to draw my breath with great vehemence, and as my chest had been injured by the fall, it may be easily imagined what were my sufferings under this infliction. The surgeon informed me that, if any rib had been dislocated, this sudden and hard breathing would restore it to its natural position. The next proceeding was not less painful and extravagant. The operator made me sit upon the ground; then, assisted by two men, he held a cloth upon my mouth and nose till I was nearly suffocated. "This," said the Chinese Esculapius, "by causing a violent heaving of the chest, will force back any rib that may have been bent inwards." The wound in the head not being deep, he healed it by stuffing it with burnt cotton. He then ordered that I should continue to walk much, supported by two persons; that I should not sit long, nor be allowed to sleep before ten o'clock at night, at which time, and not before, I should take a little hifan, that is, thin rice soup. This continued walking caused me to faint several times; but this had been foreseen by the surgeon, who had warned me not to be alarmed. He assured me that these walks in the open air, while fasting, would prevent the blood from settling on the chest, where it might corrupt. These remedies were barbarous and excruciating; but I am bound in truth to confess that in seven days I was so completely restored as to be able to resume my journey into Tartary.—*Father Ripa's Residence at the Court of Peking, in Murray's Home and Colonial Library.*

LOCOMOTION OF ANIMALS.—No. XIII.

SWIMMING.—There are countless myriads of animals which transmit themselves from place to place by swimming in liquids. But before entering into any of the details of the various organs with which animals are furnished and adapted for swimming, or the manner in which they are employed, it will be necessary to say a few words on the mechanical effects of bodies plunged in water, with respect to their specific gravities.

By the term density we understand the closeness or vicinity of the particles of which the body under consideration is composed; but mechanically it is used as a term of comparison, expressing the proportion of equal molecules, or of the quantity of matter in one body, to the number of equal molecules in the *same bulk* in another body: density, therefore, varies as the quantity of matter *directly*, and the magnitude of the body *inversely*. The specific gravity of any solid or fluid body is the absolute weight of a certain volume of the solid or fluid, which volume is assumed as the unit of bulk for measuring the specific gravities of all bodies. Density and specific gravity, therefore, appear to express the same thing under different aspects: the former being limited to the greater or less vicinity of the particles; the latter to the greater or less weight in a given volume. As it is often necessary to have recourse to these terms, the reader should clearly understand their import at the outset of this inquiry.

When an animal, or any solid body whatever, is plunged into a fluid, it will lose as much of its weight, that is, so much of it will be counteracted, as is equal to the weight of the fluid it displaces, and if its specific gravity be greater than that of the fluid, it will sink; if less, it will rise to the surface, and float there; but if the specific gravities of the solid and fluid be equal, the body will rest in any part wherever it is placed. From what has been said, we can easily know when the density and specific gravity of any solid are greater than that of a fluid, such as water, by plunging the solid in the liquid; if, for instance, it swims in water, like a cork, we know its specific gravity is less than that of the water; but if it sinks like a stone, then we conclude that its density and specific gravity are greater than that of the water. We hope enough has now been said to enable the reader to comprehend what is meant by the terms density and specific gravity, and under what circumstances any solid body, when left to itself in a fluid, will either float, sink, or remain at rest. On further investigation it will be found that some animals are lighter than water, and can float on its surface without muscular exertion; others are much heavier, and either remain at the bottoms of rivers and seas, or raise themselves by muscular action; whilst a third group are of the same gravity as water, and can remain stationary at any depth at pleasure: in this case, the force of the water in driving the animal upwards is just equal to the force of the earth's gravity in drawing it downwards. Many animals have the power of varying the specific gravity of the body, which they can by this means cause either to sink, remain stationary, or float on the surface of the water.

When we take a view of the variety of forms presented by the locomotive organs of swimming animals, it must be apparent that they perform their movements very differently. All those land animals which constantly breathe the air, especially man and the higher orders, must float on the surface of the water in swimming; they die of suffocation when water chokes up the air-tubes of the lungs, which constitutes drowning. Of all animals, there is perhaps none so helpless in water, without training, as man; and notwithstanding his vast superiority in other respects to other air-breathing animals, he is inferior to them in the employment of the locomotive organs for the purposes of swimming. Indeed, it is well known that by far the greater number of persons who are precipitated into deep water, if they cannot swim, are drowned. Let us now inquire into the cause. In the first place, the specific gravity of man is very nearly equal to that of water. It is commonly lighter than water when the chest is filled, and often heavier when the chest is emptied of air; but the open end of the respiratory tube, that is, the mouth, or the nostrils at least, must be kept above water in order to breathe. In many of the lower animals, the specific gravity and the length of the neck are such as to enable them to keep the mouth or nostrils far above the surface of the water; but in man the weight of the head, and the greater specific gravity of the body, even when the chest is filled with air, render him barely able to keep his mouth above the surface of the water, when all the rest of the body is below its surface. Still, if a person who cannot swim had sufficient presence of mind to inflate the chest, and prevent the expulsion of a large portion of air on falling into deep water, he would not ultimately sink until exhausted, if the limbs were kept motionless; but the alarm consequent upon a sudden and unexpected immersion, added to the pressure of the water upon the chest, causes the individual not only to expire the air in the lungs, which, as we have seen, should be retained, but also to make use of his limbs in an improper manner. He is involuntarily prone to throw up his arms, as if to seize some object above his head, and this creates an impulse which tends to force him still farther in the opposite direction, that is, downwards, and his struggles, being misdirected, generally tend also to sink him.

The cause of this misapplication of the limbs by man, when immersed in water, is owing to the totally different mode in which they are used in walking and running on land, to that in which they should be exercised in water, as we shall now proceed to demonstrate.

Man.—In preparing to swim, the limbs should be arranged in such a manner, that they can be made to act favourably as soon as the body is resting, unsupported by other media, in the water.

In order to propel the body there must be some movement of the limbs; and it is by the flexion and adduction of the arms, and by the extension and adduction of the legs, that the process of swimming is performed, which movements must be produced rhythmically. Suppose a person standing up to his breast in water and about to strike off in swimming; the hands are placed close to each other with the palms

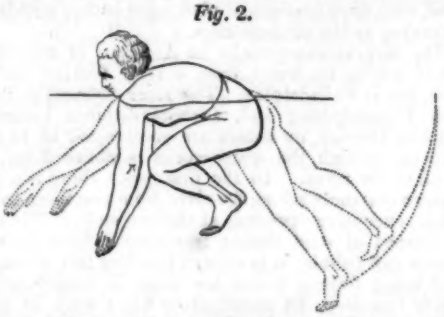
Fig. 1.

Fig. 4.

undermost near the breast, the body is thrown forward in the water, the hands are thrust out, and when the arms are fully extended as in *Fig.* 1, they diverge horizontally (the backs of the hands being turned towards each other), describing curves until they are brought round under the armpits, and again extended. It should be observed that the arms must always be kept in advance of a line passing through the axes of the shoulder-joints.

Let us now advert to the action of the legs. Whilst the arms are describing their curves the legs are drawn forwards under the body, the knees being separated as much as possible, and the toes turned outwards as in *Fig.* 2, and whilst the arms are regaining

Fig. 2.



their extended position the legs are extended backwards and outwards with a moderate degree of velocity, the soles of the feet being turned outwards, and are then brought together again, simultaneously with the arms, into the attitude shown in *Fig.* 1.*

It will be observed that the arms and legs have each four distinct kinds of motion, namely, extension, abduction, adduction, and flexion, but the effects of these motions are different. The extension of the arms retards the motion of the body, whilst that of the legs accelerates it: the abduction of the arms accelerates, and of the legs slightly retards; the adduction of the arms slightly retards, and of the legs accelerates; and the flexion of both arms and legs retards. The simultaneous performance of these motions is exhibited in the following tabular form:—

Arms.		Legs.
Abduction	. . .	Flexion
Adduction }		{ Extension
Flexion . }	. . .	{ Abduction
Extension	. . .	Adduction

It is upon the rhythm with which these periodic movements are performed that the success of swimming depends, the whole being seen in outline in *Figs.* 1 and 2.

We may also observe, that when the arms are abducted, or drawn outwards and backwards, the legs are drawn forwards; and when the arms are flexed and brought together, the legs are extended outwards; and lastly, when the arms are thrust forwards, the legs are brought close together; so that whilst the force of the arms is positive, that of the legs is negative, and *vice versâ:* but it is evident that the effective forces in swimming preponderate, or the body would either remain stationary or move backwards, and this results from the shape of the limbs and the manner in which they can be made to act.

From what has been said, we may easily perceive how differently the limbs act in swimming from what they do in walking, and that the arms and legs interchange their effective strokes alternately. These movements are not difficult to perform, but it requires some attention and practice in order to accomplish them with precision. Indeed they may be practised out of water, and sufficient habit be obtained to know how to act if by chance a person were suddenly immersed and in danger of being drowned. But it should also never be forgotten that almost all persons will float, if the chest be kept well filled whilst immersed in the water. It however requires great fortitude and self-possession to keep the limbs quiet and under water, and at the same time to stop the inspiratory movement until the mouth rises above the surface of the water.

Swimming on the back is usually effected by means of the legs alone. The attitude preparatory to this movement is seen in *Fig.* 3. The head is bent backwards

Fig. 3.

so far that the water may cover the forehead, and reach to the level of the eyes; the chest is elevated, and the hands placed on the hips; the motions of the legs are indicated by the dotted lines in *Fig.* 4, and are the same as those of the legs in swimming on the breast. We may here state that any one who can swim on his breast will experience no more difficulty in turning himself round on his back in the water than in turning himself in his bed.

Some persons can accomplish swimming on the side, and others on the back, without using the legs; and

Fig. 5.

Figs. 6, 7, 8.

* These figures are reduced from the elementary course of Gymnastic Exercises by Captain Clias.

many other feats, such as with the arms acting in different directions as seen in *Fig.* 5, and again with one hand alone. In diving, two methods are recommended: one by leaping into the water with the feet downwards, the other head foremost; the former is most desirable in shallow water, the latter when the head is subject to giddiness and fulness of blood.

Figs. 6 and 7 show the attitude preparatory to plunging into the water, and *Fig.* 8 the position of the limbs in diving to the bottom of the river.

The position of greatest ease in the water is *floating*. The body lies on the back, with the face only above the water; the limbs are perfectly quiescent, and extended as in *Fig.* 9. This state can only be maintained when the specific gravity of the body is less than that of the water.

Fig. 9.

Sea-water, being heavier than that of rivers, is best calculated to support a person in swimming, and those who are specifically heavier than river-water may be sustained in a floating position in sea-water. It may be observed that man being so nearly of the same specific gravity as water, and air being nearly one thousand times lighter, that a few cubic inches of air in a bag are sufficient to keep one who cannot swim permanently at its surface; or a few pounds of cork fastened to the body will accomplish the same object: and it is astonishing that, notwithstanding the great number of persons who are annually drowned in the Thames alone, no means are adopted to provide some such simple method for sustaining the body in water by boatmen; and still more that we bear of watermen being frequently drowned in consequence of *not having learned to swim*. Swimming ought to form a part of our physical education; all our youth of both sexes may do so with advantage, for the purpose of cleanliness and to increase their health and strength, as well as to provide a safeguard against subsequent accidents. The ancients placed a high value on the art of swimming. Cato taught his son to traverse the most rapid and dangerous gulfs;* the Greeks and Romans attached great importance to it. Julius Cæsar crossed rivers by swimming at the head of his legion. It is said that Charlemagne was one of the best swimmers of his day. It is also well known that Lord Byron swam across the Hellespont several times; and Mr. Smith, an English officer, swam across the Lake of Geneva from Morges to Amphion and back without stopping, being a distance of seven miles and a half. The Caribs swim with the ease of fishes, the women as well as the men. If a canoe overturns, which is a thing of frequent occurrence, their being drowned is never heard of; on these occasions the children may be seen swimming about their mother like so many little fishes, and the mothers are capable of supporting themselves in the water with their children at their breasts, whilst the men are putting the boat to rights. These examples teach us how far safety might be acquired and how many hundreds of lives might be saved if the art of swimming were taught in our schools.

SUPPLY OF WATER IN AMERICAN TOWNS.

THE United States being comparatively a new country, we may naturally expect to find that the modern contrivances and improvements introduced in other countries are more or less adopted there. It will be interesting to see how far they bear analogy with us in the important matter of the supply of water to their large towns.

From Mr. Stevenson's work on the Civil Engineering of North America, we learn that there are two general modes of ensuring this supply; and, since the publication of that work, a grand undertaking called the Croton Aqueduct has introduced a third method. These three methods are, 1st. Collecting in reservoirs the water of a river passing by or through the town. 2nd. Digging wells into the watery strata beneath the surface of the ground. 3rd. Bringing water in artificial channels from a great distance. It is known to every one who has given common attention to this subject, that all these three methods are adopted in England, with modifications of plan more or less extensive, according to the circumstance.

The largest water-works in America, of that class which derive the water from a river flowing on the spot, are at Philadelphia. The river Schuylkill flows past Philadelphia; and, a short distance before it reaches the city, its waters are so diverted as to flow into or through the water-works established on one bank of the river. In the first place there is a dam thrown obliquely across the river from one shore to the other, excepting openings at the two ends. This dam is formed of solid timber frame-work, filled up with stones and rubble; it is sixteen hundred feet in length, and being formed where the water is twenty-five or thirty feet deep, its construction was a work of some difficulty. The regular flow of the water is checked by this dam, and a consequent stagnation occurs for six miles upwards; but a channel for navigation is formed by a canal with locks at one end of the dam; while a large body of water flows through the opening at the other end of the dam with sufficient force to turn powerful water-wheels. These wheels work pumps, whereby the river-water is pumped up into vast reservoirs above; so that the dam is formed only as a means to obtain power to turn the wheels. There are the means to direct the body of water either into the water-works, or by a sluice into the part of the river below the dam, at pleasure.

The water acts upon eight very large wheels, the rotation of which works eight large pumps, and these pumps raise the river-water into the reservoirs. Each pump raises half a million gallons of water per day, and this vast body of water is forced by the pumps to a height of not less than ninety feet. The pipe through which the flow takes place is made of cast-iron, and is sixteen inches in diameter. The reservoirs provided for the collecting and storing of the water are placed at an elevation of about an hundred feet above the level of the river, and about fifty feet above the highest streets in Philadelphia; they are four in number, and present altogether an area of six acres. The reservoirs are founded on an elevated rock, but the water is retained by means of artificial walls and embankments. These enclosures are of great strength, and the bottom of the reservoirs is well paved with cemented brick. The depth of water, when filled, is about twelve feet; and the amount then contained is more than twenty millions of gallons. The use of having four reservoirs instead of one equal to them in area, is to facilitate the purification of the water; for the water, after being discharged from the force-pumps into one of them, passes through a filter into the second reservoir, then through another filter into the third, and similarly to the fourth; so that it undergoes three filtrations before it enters the pipes which supply the town.

The water is conveyed from the reservoirs, and distributed through the town, by means of about a hundred miles of cast-iron pipe, beginning at two feet in diameter near the reservoirs, and being reduced to

* Plutarch's Life of Cato.

twelve, six, and three inches, according to the streets through which they pass. The water flowing in this way from the reservoirs into the city, varies from about two to four millions of gallons per day, according to the season of the year, averaging more than three millions. In 1836 this supply was distributed by means of private pipes to about seventeen thousand renters or tenants, and by public pumps to about three thousand more, making twenty thousand families supplied with water from the works. For this quantity the inhabitants paid a water-rate amounting to rather above twenty thousand pounds, or about a guinea per house per year, poor and rich together.

The town of Richmond, in Virginia, is supplied with water from the James river, on a principle analogous to that here explained, but on a smaller scale. The water is raised by means of water-wheels to so great a height as a hundred and sixty feet above the level of the river, into two large reservoirs, and is thence distributed through the town in iron pipes.

Pittsburgh, on the Ohio, is similarly supplied; the water being raised from the river to a height of about a hundred feet and thence distributed. Montreal is in like manner supplied from the river St. Lawrence. Cincinnati, in the State of Ohio, until within a few years was supplied with the water of the Ohio, by having it pumped up by horse-power to reservoirs at a height of a hundred and sixty feet; but as the tanks were only large enough to supply a wooden main-pipe three or four inches in diameter, the increase in the number of inhabitants rendered a change of plan necessary; steam-power was substituted for horse-power to raise the water, and iron pipes of large diameter replaced those of smaller size for the mains.

Many towns are so situated that they have not a fresh-water river passing through or in immediate contiguity; and in such cases other modes of supply are sought. The town of Boston, for example, is almost entirely surrounded by the sea, and hence the inhabitants are supplied from wells. In 1835 there were said to be more than two thousand seven hundred wells in Boston, of which thirty-three were Artesian; only seven, however, of the whole number yielded soft water, the mineral strata through which it flowed having given a hard quality to the water of all the other wells. The digging of some of these Boston wells was attended with effects which illustrate in an instructive manner the elastic force of the water sometimes concealed and accumulated beneath the surface of the ground. Mr. Stevenson quotes the following account of one of these from Dr. Lathrop:—'A few years before, an attempt was made to dig a well a few rods to the east near the sea. Having dug about sixty feet in a body of clay without finding water, preparation was made in the usual way for boring; and, after passing about forty feet in the same body of clay, the augur was impeded by stone. A few strokes with a drill broke through the slate covering, and the water gushed out with such rapidity and force that the workmen with difficulty were saved from death. The water rose to the top of the well, and ran over for some time. The force was such as to bring up a large quantity of fine sand, and all their labour was lost."

New York, beyond all the cities in America, affords the most interesting features in respect to the supply of water. Within the last few years its inhabitants have planned and carried out a project partaking much of the grandeur and magnitude of the ancient aqueducts; and if the expectations of the engineer should prove to be permanently realized, the system will remain as a creditable monument to the skill and commercial liberality of the state.

To understand the nature of these works, it will be necessary to glance at the topographical position of the city of New York. The river Hudson, after flowing nearly due south for many miles, falls into the Atlantic in a bay or recess; and close to its mouth are three islands—Long Island, Staten Island, and Manhattan Island. The city of New York is situated on the last named of these three; so that it is cut off by salt water from the main-land and from both the other islands. This local position has had a good deal to do with the arrangements for the supply of water. The inhabitants have hence been led to obtain a supply by means of wells, which have been sunk in different parts of the city, and the water was raised from them by steam-power into elevated reservoirs, from whence pipes conveyed it to the various streets. Some belonged to a water-company, and some to the corporation. One of these, after descending rather more than a hundred feet, had three lateral channels branching from it, for the purpose of collecting water from different directions; and the well, thus augmented, yielded twenty thousand gallons per day. Some of the wells, by a more extensive system of these lateral galleries or channels, yielded more than a hundred thousand gallons per day.

But although the wells, simply as such, yielded largely, yet the supply gradually became more and inadequate to the wants of a largely increasing population; and the attention of the corporation has been long directed to the means of ensuring a better supply. Other towns, whether deficient or not in rivers passing through them, have had a supply ensured by laying down pipes from a spring situated on a hilly spot at some distance. Thus Albany, a large town on the Hudson, and the second in importance in the state of New York, is principally supplied with water procured in the high ground in the neighbourhood, and conveyed in a six-inch pipe for a distance of about three miles to a reservoir near the town. Troy, another town on the Hudson, higher up than Albany, is supplied by similar means: there is high ground in the neighbourhood, containing good water; and this water is conveyed into a reservoir capable of holding two million gallons, elevated about seventy feet above the level of the streets, and distant about a third of a mile from the town; and from this reservoir the water is conveyed through a twelve-inch pipe to the streets of the town.

But this source is denied to the inhabitants of New York; and therefore, having no high ground near the city to furnish a supply, having no fresh-water river at hand to supply water-works, and having an insufficiency of wells to ensure a supply, they have been led to exercise their ingenuity in another way.

[To be continued.]

ADULTERATION OF ARTICLES OF CONSUMPTION.

The selling of unwholesome provisions, as meat or fish, is punishable under most local acts; and is also an offence at common law. In Paris, malpractices connected with the adulteration of food are investigated by the Conseil de Salubrité, acting under the authority of the prefect of police. In this country, where the interests of the revenue are concerned, strict regulations have been resorted to in order to prevent adulteration. It is not, however, heavy customs or Excise-duties alone which encourage adulteration, for the difference in price between the genuine and the spurious ingredient, when both are free from taxation, leads to the practice of adulteration. The following is an abstract of the law respecting the adulteration of some of the principal articles of revenue:—

Tobacco-manufacturers are liable to a penalty of 200*l.* for having in their possession sugar, treacle, molasses, honey, commings or roots of malt, ground or unground roasted grain, ground or unground chicory, lime, umbre, ochre, or other earths, sea-weed, ground or powdered wood, moss or weeds

or any leaves, or any herbs or plants (not being tobacco leaves or plants), respectively, or any substance or material, syrup, liquid, or preparation, matter, or thing, to be used or capable of being used as a substitute for, or to increase the weight of, tobacco or snuff (5 & 6 Vict. c. 93, § 8). Any person engaged in any way in the preparation of articles to imitate or resemble tobacco or snuff, or who shall sell or deliver such articles to any tobacco-manufacturer, is also liable to a penalty of 200*l.* (§ 8). The penalty for adulterating tobacco or snuff is 300*l.* § 1); and for having such tobacco or snuff in possession, 200*l.* (§ 3). The Excise-survey on tobacco-manufacturers, abolished by 3 & 4 Vict. c. 18, has been re-established in consequence of the extent to which adulteration was carried.

The ingredients used in the adulteration of beer are enumerated in the following list of articles which brewers or dealers and retailers in ale and beer are prohibited from having in their possession under a penalty of 200*l.* (56 Geo. III. c. 58, § 2). These articles are—molasses, honey, liquorice, vitriol, quassia, cocculus Indicus, grains of Paradise, Guinea pepper, and opium; and preparations from these articles are also prohibited. They are used either as substitutes for hops or to give a colour to the liquor in imitation of that which it would receive from the use of genuine ingredients. By § 3 of the same act a penalty of 500*l.* is imposed upon any chemist, druggist, or other person, who shall sell the articles mentioned in § 2 to any brewer or dealer in beer. The penalties against dealers in beer in the above act are extended to beer-retailers under 1 Wm. IV. c. 64, and 4 & 5 Wm. IV. c. 85, which acts also contain special provisions against adulteration applicable to this particular class of dealers; and the licence also prohibits the sale of ale, beer, and porter, made otherwise than from malt and hops; or adulterated with drugs; or fraudulently diluted, adulterated, or deteriorated.

Tea, another important article of revenue, is protected from adulteration by several statutes. The act 11 Geo. I. c. 30, § 5, renders a tea-dealer liable to a penalty of 100*l.* who shall counterfeit, adulterate, alter, fabricate, or manufacture any tea, or shall mix with tea any leaves other than leaves of tea (§ 5). Under 4 Geo. IV. c. 14, tea-dealers who dye, fabricate, or manufacture any sloe-leaves, liquorice-leaves, or the leaves of tea that have been used, or any other leaves in imitation of tea; or shall use terra japonica, sugar, molasses, clay, logwood, or other ingredients, to colour or dye such leaves; or shall sell or have in their possession such adulterated tea, are liable to a penalty of 10*l.* for every pound of such adulterated tea found in their possession (§ 11). The 17 Geo. III. c. 29, also prohibits adulteration of tea (§ 1).

The adulteration of coffee and cocoa is punished with heavy penalties under 43 Geo. III. c. 129. Any person who manufactures, or has in his possession, or who shall sell, burnt, scorched, or roasted peas, beans, grains, or other grain, or vegetable substance prepared as substitutes for coffee or cocoa, is liable to a penalty of 100*l.* (§ 5). The object of § 9 of 11 Geo IV. c. 30, is similar. Chicory has been very extensively used in the adulteration of coffee in this country. This root, which possesses a bitter and aromatic flavour, came into use on the Continent in consequence of Bonaparte's decrees excluding colonial produce. Coffee with which a fourth or a fifth part of chicory has been mixed, is by some persons preferred as a beverage to coffee alone; but in England it is used to adulterate coffee in the proportion of one half. The Excise has for some time permitted the mixture of chicory with coffee. In 1832 a duty was laid on chicory, and this duty has been increased: chicory itself is also adulterated. Besides the quantity imported, chicory is also grown in England, and to prevent fraud it will be necessary to place the cultivation under some restriction, or perhaps, as in the case of tobacco, to prohibit the growth of it altogether.

The manufacturer, possessor, or seller of adulterated pepper is liable to a penalty of 100*l.* (59 Geo. III. c. 53, § 22). The act 9 Geo. IV. c. 44, § 4, extends this provision to Ireland.

In the important article of bread there are prohibitions against adulteration, though they are probably of very little practical importance. The act 6 & 7 Wm. IV. c. 37, which repealed the several acts then in force relating to bread sold beyond the city and liberties of London, and ten miles of the Royal Exchange, was also intended to prevent the adulteration of meal, flour, and bread beyond these limits. No other ingredient is to be used in making bread for sale except flour or meal of wheat, barley, rye, oats, buckwheat, Indian corn, peas, beans, rice or potatoes, mixed with common salt, pure water, eggs, milk, barm, leaven, potato or other yeast, in such proportions as the bakers think fit (§ 2). Adulterating bread, by mixing other ingredients than those mentioned above, is punishable by a fine of not less than 5*l.* nor above 10*l.*, or imprisonment for a period not exceeding six months; and the names of the offenders are to be published in a local newspaper (§ 8). Adulterating corn, meal, or flour, or selling flour of one sort of corn as flour of another sort, subjects the offender to a penalty not exceeding 20*l.* and not less than 5*l.* (§ 9). The premises of bakers may be searched, and if ingredients for adulterating meal or flour be found, the penalty for the first offence is 10*l.* and not less than 40*s.*; for the second offence 5*l.*, and for every subsequent offence 10*l.*; and the names of offenders are to be published in the newspapers (§ 12). There are penalties for obstructing search (§ 13). Any miller, mealman, or baker acting as a justice under this statute incurs a penalty of 100*l.* (§ 15).

The above act did not apply to Ireland, where the baking trade was regulated by an act (2 Wm. IV. c. 31), the first clause of which, relating to the ingredients to be used, was similar to the English act just quoted. In 1838 another act was passed (1 Vict. c. 28), which repealed all former acts relating to the sale of bread in Ireland. The preamble recited that the act 6 & 7 Wm. IV. c. 37, had been found beneficial in Great Britain; and the clauses respecting adulteration are similar to the English act.

The several acts for regulating the making of bread within ten miles of the Royal Exchange (which district is excluded from the operation of 6 & 7 Wm. IV.) were consolidated by the act 3 Geo. IV. c. 106. Under this act any baker who uses alum, or any other unwholesome ingredient, is liable to the penalties mentioned in § 12 of 6 & 7 Wm. IV. c. 37. Any ingredient or mixture found within the house, mill, stall, shop, &c. of any miller, mealman, or baker, and which shall appear to have been placed there for the purpose of adulteration, renders him liable to similar penalties.

Other articles besides those which have been mentioned are adulterated to a great extent, and there is scarcely an article, from arrow-root to guano, which escapes; but perhaps the remedy for the evil is not unwisely left to the people themselves, who probably are less likely to be imposed upon when depending on the exercise of their own discrimination, than if a commission of public functionaries were appointed, whose duty should consist in investigating and punishing persons guilty of adulteration. The interference of the government in this country with the practice of adulteration, except in the case of bread and drugs, has evidently had no other object than the improvement of the revenue.

Adulteration and the deceitful making up of commodities appear to have frequently attracted the attention of the legislature in the sixteenth century, and several acts were passed for restraining offences of this nature. The act 23 Eliz. c. 8, prohibits under penalties the practice of mixing bees'-wax with rosin, tallow, turpentine, or other spurious ingredient. The following acts have reference chiefly to frauds in the making up of various manufactured products:—3 Hen. VIII. c. 6; 23 Hen. VIII. c. 17; 1 Eliz. c. 12; 3 & 4 Edw. VI. c. 2; 5 & 6 Edw. VI. c. 6; 5 & 6 Edw. VI. c. 23.—*From the Supplement to the Penny Cyclopædia.*

Physical Effects of Training.—The state of health, or 'condition,' as it is termed, into which a man may be brought by training is often extraordinary. This training, it must be understood, consists in nothing more than regular exercise and living. The most salubrious and retired country places are usually chosen, and there the man, under the guidance of an experienced trainer, performs his systematic duties. He retires early to his bed, which is a mattress, with sufficient covering to ensure a suitable warmth, without encouraging unnecessary perspiration. He rises betimes in the morning, and after a general washing and rubbing, partakes of a slight repast, and commences his day's work by a quick walk of a few miles. He then returns home, and eats with what appetite he can. After a short rest, he is again exercised until his next meal-time, and so on throughout the day. His diet is chiefly confined to the lean of underdone beef and mutton, fowl, and stale bread. He takes two or three glasses of sherry, with, perhaps, a little old ale daily. The distance he is made to walk and run, every day, varies from ten to forty miles. He begins with what he is conveniently able to bear, and increases his exertions in proportion to his increasing strength.—*Medical Times.*